

# Energy Transfers in a System

## Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.1 Energy
Sub-Topic	Energy Transfers in a system
Difficulty Level	Bronze Level
Booklet	Question Paper

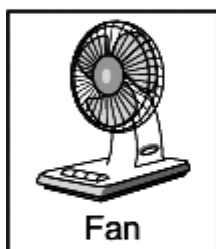
**Time Allowed:** 20 minutes

**Score:** /20

**Percentage:** /100

**Grade Boundaries:**

Q1. The appliances shown below transfer electrical energy to other types of energy.



(a) The vacuum cleaner is designed to transfer electrical energy to kinetic energy.

Three more of the appliances are also designed to transfer electrical energy to kinetic energy. Which **three**?

Draw a ring around each correct appliance.

3

(b) Which **two** of the following statements are true?

Tick (✓) **two** boxes.

Appliances only transfer part of the energy usefully.

☐

The energy transferred by appliances will be destroyed.

☐

The energy transferred by appliances makes the surroundings warmer.

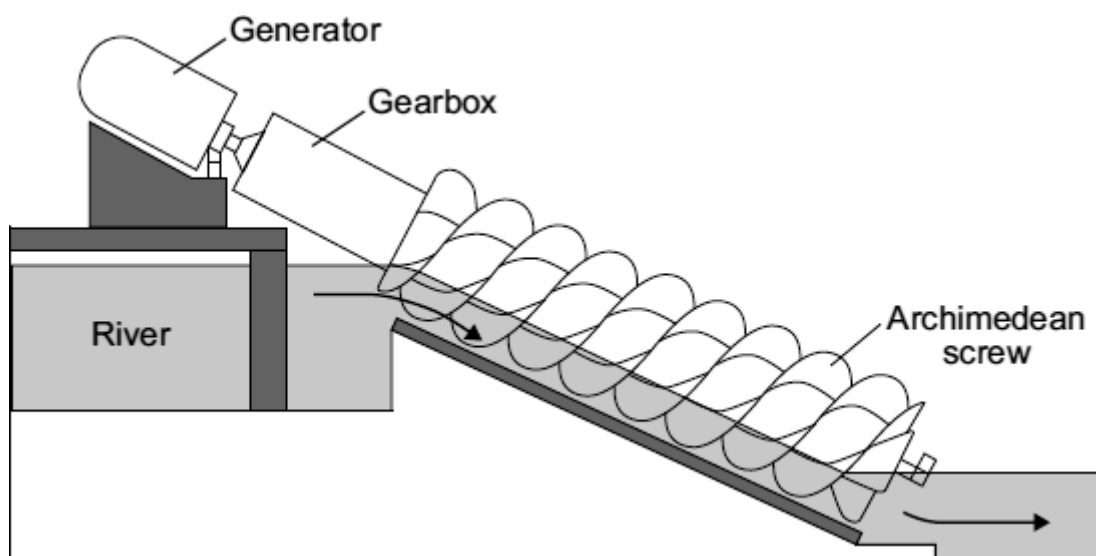
☐

The energy output from an appliance is bigger than the energy input.

☐

(2)  
(Total 5 marks)

- Q2.** The diagram shows a small-scale, *micro-hydroelectricity* generator which uses the energy of falling river water to generate electricity. The water causes a device, called an Archimedeian screw, to rotate. The Archimedeian screw is linked to the generator by a gearbox.



- (a) Complete the following sentence by drawing a ring around the correct word in the box.

The gravitational potential energy of the falling water is transformed

into the 

chemical
electrical

 energy of the Archimedeian screw.

kinetic

(1)

- (b) A micro-hydroelectric system generates about 60 kW of electricity, enough for 50 homes. A conventional large-scale hydroelectric power station may generate more than 5 000 000 kW of electricity.

- (i) Give **one** advantage of a conventional large-scale hydroelectric power station compared to a micro-hydroelectric system.

.....  
.....

(1)

- (ii) Which **one** of the following statements gives a **disadvantage** of a conventional large-scale hydroelectric power station compared to a micro-hydroelectric system?

Put a tick (✓) in the box next to your answer.

Energy is wasted as heat and sound.

☐

Large areas of land are flooded.

☐

A constant flow of water is needed.

☐

(1)

- (c) The electricity generated by the micro-hydroelectric system is transferred directly to local homes. The electricity generated by a conventional large-scale hydroelectric power station is transferred to homes anywhere in the country through a system of cables and transformers.

- (i) What name is given to the system of cables and transformers used to transfer electricity to homes anywhere in the country?

.....

(1)

- (ii) Using short cables to transfer electricity to local homes is much more efficient than using very long cables to transfer electricity to homes anywhere in the country.

Why?

.....

.....

(1)

- (d) Nepal is a mountainous country with over 6000 rivers. In Nepal, 9000 kW of electricity are generated using micro-hydroelectric generators.

Suggest **one** reason why in the UK much less electricity is generated using micro-hydroelectric generators, than in Nepal.

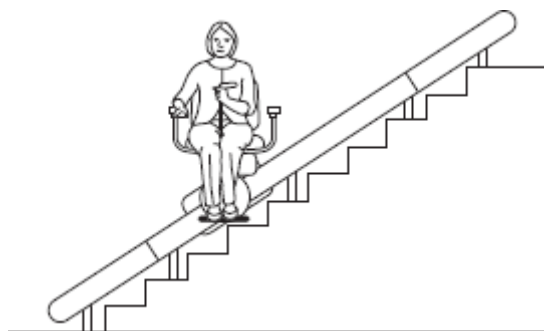
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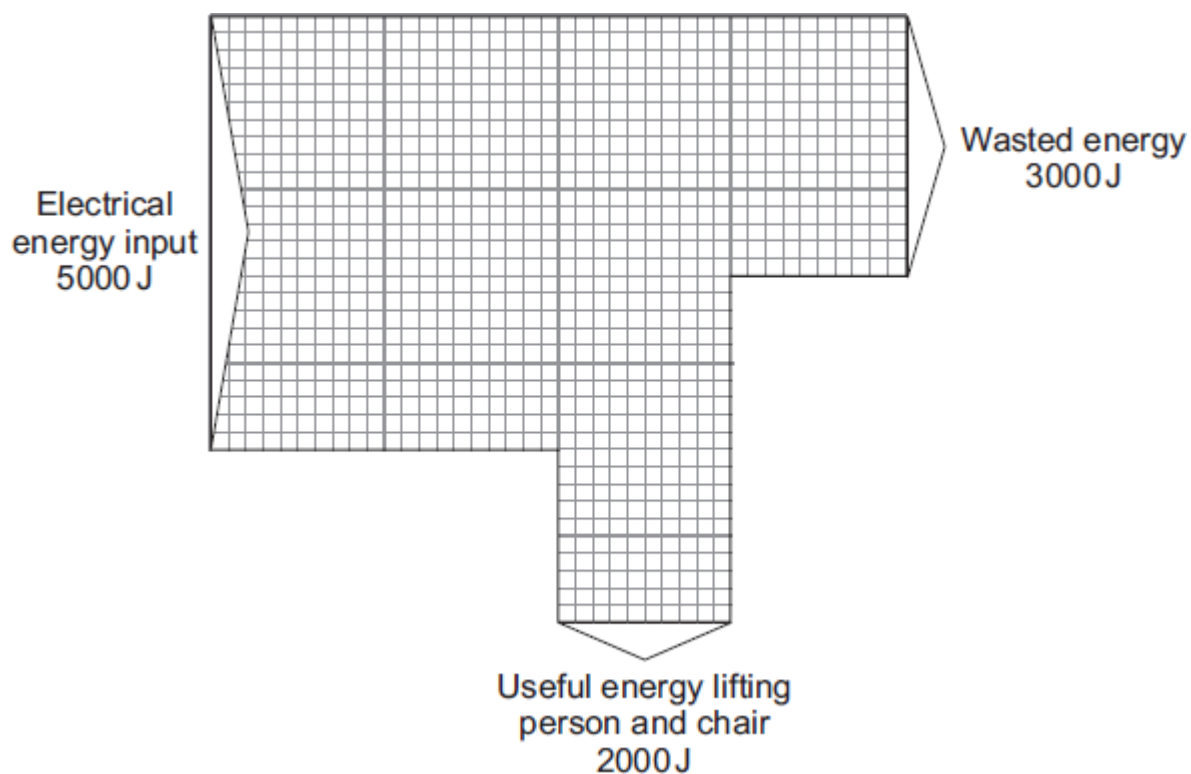
(1)

(Total 6 marks)

- Q3.** A person uses a stairlift to go upstairs. The stairlift is powered by an electric motor.



The Sankey diagram shows the energy transfers for the electric motor.



- (a) Complete the following sentence.

The electric motor wastes energy as ..... energy.

(1)

- (b) Use the equation in the box to calculate the efficiency of the electric motor.

$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$
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Show clearly how you work out your answer.

.....  
 .....

Efficiency = .....

(2)

(Total 3 marks)

- Q4.** The picture shows a solar-powered aircraft. The aircraft has no pilot.



Photo by NASA.

- (a) On a summer day, 175 000 joules of energy are supplied to the aircraft's solar cells every second. The useful energy transferred by the solar cells is 35 000 joules every second.
- (i) Use the equation in the box to calculate the efficiency of the solar cells.

$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$
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Show clearly how you work out your answer.

.....  
.....

Efficiency = .....

(2)

- (ii) What happens to the energy that is **not** usefully transferred by the solar cells?

.....

(1)

- (b) The aircraft propellers are driven by electric motors. As well as the solar cells, there are fuel cells that provide additional power to the electric motors.

- (i) Suggest **one** advantage of the aircraft having fuel cells as well as the solar cells.

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(1)

- (ii) Give **one** environmental advantage of using electric motors to drive the aircraft propellers rather than motors that burn a fuel.

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(1)

- (iii) Eventually, the designers want to produce an unmanned aircraft that can fly at twice the height of a passenger jet for up to six months.

Suggest **one** possible use for an aircraft such as this.

.....

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(1)

(Total 6 marks)